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ABSTRACT

A study was conducted to develop a questionnaire for gauging student perceptions of the graphic climate (the extent to which students habitually use and construct appropriate graphics during the reading and studying process) in middle and high school history classes. The questionnaire was a 4-point Likert scale consisting of 18 questions, five of which had more than one part, giving a total of 31 items. The questionnaire required students to discriminate among the various kinds of graphics (maps, illustrations, charts and flow charts, graphs, and cartoons) and to know that the word "graphics" referred to all of these. The questionnaire was administered to 176 seventh graders and 205 eleventh graders. The questionnaire proved to be reliable and easily administered and analyzed. However, it lacked content validity. In other words the students did not perceive the content of the questionnaire as a whole. Nevertheless, the data did suggest that the categories of questions were content valid. They included (1) the use and construction of graphics, (2) the comprehension of graphics, (3) the value of using and constructing graphics, (4) the value of textbook graphics, and (5) the value of learning more about graphics. Two tables and five figures are appended.

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THE GRAPHIC CLIMATE IN HISTORY CLASS: THE PERCEPTIONS OF SEVENTH AND ELEVENTH GRADERS

Research indicates that students' comprehension and recall of text increases if the following propositions are true:

1. The text contains appropriate graphics (e.g., Friedman & Tinzmann, 1985).
2. Students use the text's graphics or construct their own appropriate graphics before, during, or after reading (e.g., Schallert, 1980).
3. Students use the text's graphics or construct their own appropriate graphics while studying (e.g., Armbruster & Anderson, 1980).

A classroom in which students habitually use and construct appropriate graphics during the reading and studying processes has a good graphic climate.

The actions and attitudes of students and their teachers create the graphic climate of a classroom. For instance, students rarely use or construct graphics if they think that such activities are useless. Similarly, if a teacher ignores the textbook graphics, students are likely to pay the graphics no more than cursory attention.

Ideally, the assessment of the graphic climate in a classroom or school would consist of three procedures:

1. analyzing the textbook graphics
2. observing student and teacher behavior
3. questioning students and teachers about the cognitive and affective reasons for their behavior

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The ideal assessment of graphic climate, then, is labor intensive. Few teachers, administrators, or researchers are likely to have the time or inclination to undertake it. Two aspects of the ideal assessment, analyzing textbook graphics and observing student and teacher behavior, are inherently labor intensive. In contrast, questioning students and teachers is not inherently labor intensive. One can administer and analyze a brief questionnaire relatively quickly.

This study tested the adequacy of a questionnaire designed to gauge student perceptions of the graphic climate in middle grade and high school history classes. An adequate questionnaire was defined as a content valid, reliable questionnaire which could be quickly administered and analyzed. Middle grade and high school history classes were chosen because of their plentiful instructional opportunities for using and constructing graphics and the large number of graphics in their textbooks.

METHOD

Subjects

Nine seventh grade history classes, 199 students, completed the questionnaire. Five classes, 115 students, were from public elementary schools in a large urban school system. Four classes, 84 students, attended a suburban public elementary school. In neither case were the seventh graders grouped by achievement.

Ten eleventh grade history classes, 212 students completed the questionnaire. Students attended two suburban public high schools. Students in one high school were grouped by three achievement levels: low, middle, and high.

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Materials

The questionnaire. The questionnaire consisted of 18 questions, five of which had more than one part, giving a total of 31 items. The questionnaire was a 4 point Likert scale. The answers or choices concerned either quantity (1-never, 2-seldom, 3-often, 4-always) or agreement (1-strongly disagree, 2- disagree, 3-agree, 4-strongly agree).

The questions were drawn from two cognitive categories and three affective categories within the domain of graphic climate. The two cognitive categories are:

1. The Use and Construction of Graphics
2. The Comprehension of Graphics

The three affective categories are:

3. The Value of Using and Constructing Graphics
4. The Value of Textbook Graphics
5. The Value of Learning more about Graphics

The categories were chosen for their possible explanatory power. Consider the following example. Leslie's students have completed the questionnaire. Analysis shows that the students believe they rarely use or constuct graphics (category 1). She looks at her analyses to find reasons for this state of affairs. Do they believe that they do not comprehend graphics (category 2)? Perhaps they think using and constructing graphics are wortheless activities (category 3). Maybe they think the textbook graphics do not help them to understand what they read (category 4). How will the students react if I spend more time teaching about, and with graphics (category 5)? As the example illustrates, items in categories 2, 3, and 4 focus analysis on possible explanations of student responses to items in category 1. Category 5 focuses the teacher's thoughts on how he or she might try to change

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student responses in category 1. and thereby perhaps changing their actions as well.

The questionnaire was reviewed by six elementary and high school social studies teachers, two educational testing experts, and two sociologists. The questionnaire was revised on the basis of their suggestions.

Example graphics. The questionnaire required students to discriminate among the various kinds of graphics (maps, illustrations, charts and flow charts, graphs, and cartoons) and to know that the word 'graphics' referred to all the various kinds. To increase the probability that these requirements were met, two sets of examples were developed. The two sets differed only in size. One set was printed as a pamphlet which could be placed on a desk. The other set consisted of large posterboards which could be seen from the back of a classroom. Each set contained examples of illustrations, graphs, maps, charts, flowcharts, and cartoons.

Procedure

The questionnaire was administered by either of the two investigators in four grade school and eight high school classes. Teachers admistered the questionnaire in five grade school and two high school classes. Teachers were provided a written set of instructions for administering the questionnaire.

First the questionnaires were distributed and the sets of examples were either distributed or displayed. The administrator then explained the purpose of the questionnaire and discussed the examples. The students were directed to complete the questionnaire, making sure that they answered every question. The students were told that all questions

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they might have about the questionnaire would be answered. In all classes students completed the questionnaire in 20 minutes or less.

RESULTS

Twenty-three seventh graders and seven eleventh graders did not answer every question. Their questionnaires were not included in the data analysis, leaving 176 seventh graders and 205 eleventh graders.

The reliability of the questionnaire was measured by computing coefficient alphas for each of the two grades. Coefficient alpha was

that the graphic climate questionnaire was reliable for seventh and eleventh grade students.

Our evaluation of content validity required moderate internal consistency among the items of the questionnaire and among items in each category. Thus, item score/total questionnaire score Pearson r correlations and item score/total category score Pearson r correlations were computed. Correlations of .40 and above were taken to indicate moderate internal consistency.

Insert Table 1 about here.

Table 1 shows that, for eleventh graders, 25 of 31 items in the questionnaire correlated moderately with the questionnaire as a whole. Four of the six items were in the comprehension of graphics category. In contrast, only 17 of 31 items correlated moderately with the questionnaire for seventh graders. All of the items in the comprehension of graphics category and five of eight items in the Use and Construction of graphics category had correlations below .40.

All but one of the 31 items correlated moderately with other items in their category for the eleventh graders. All but three of the items

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correlated moderatley with other items in their category for the seventh graders.

The correlations suggest that that graphic climate questionnaire was not content valid for either eleventh or seventh graders, although it comes closer to content validity for eleventh graders. The problem would seem to reside in the relation between the cognitive and affective categories. However, the categories themselves appear to be content valid at both grade levels.

Means and standard deviations of student responses were calculated for those items which correlated above .40 with other items in their category. These results are shown in Table 2. (The higher the mean is, the more positive the average student response is.)

Insert Table 2 about here.

Two notable generalizations emerge from Table 2. First, the seventh grade standard deviations are in all cases greater than the eleventh grade standard deviations. Second, seventh grade means are higher than eleventh grade means on all but one item in three categories: The use and construction of graphics, the value of using and constructing graphics, and the value of learning more about graphics.

Figures 1 through 5 show means and standard deviations of student responses by graphic climate category along with the questions from the categories. Taken together, Figures 1 through 5 display similar patterns of seventh and eleventh grade means within each of the categories.

Insert Figure 1 about here.

Figure 1 provides the following picture of the students'

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perceptions of their use and construction of graphics during the reading and studying processes. They use textbook graphics much more frequently than they construct their own. They are more likely to construct graphics during the reading process than while studing. They use the textbook graphics more often while reading than after and more often after reading than before. In contrast, they construct graphics more often before reading than during reading and more often during reading than after reading.

Insert Figure 2 about here.

Figure 2 shows that on the average these students think they comprehend various kinds of graphics better than they show their comprehension on tests. Eleventh graders believed they had the most difficulty comprehending cartoons, while seventh graders belived that charts and flow charts were most difficult to comprehend.

Insert Figures 3, 4, and 5 about here.

Figure 3 indicates that seventh and eleventh graders think it better to construct, rather than use, graphics while studying. Eleventh graders found illustrations most helpful while reading. The questions in Figure 4 make it clear why question 11 did not correlate even moderately with the questionnaire or its category. Question 11 asks students to think about a relatively unfamiliar purpose of textbook graphics which is not obviously related to education. One will also notice that questions 12 and 18 are similar to each other as are the means of the student responses. Figure 5 indicates that seventh graders claim to be more interested in learning about, and using, graphics.

In summary, Figures 1 through 5 provide a relatively detailed

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description of the students' perceptions in five categories of graphic climate. Much of the description is not surprising. For instance, it is not surprising that the students use the textbook graphics more frequently than they construct their own. Nor is it surprising that they found cartoons, charts, and flowcharts relatively difficult to comprehend. However, other parts of the description strike the investigators as somewhat disconcerting. For instance, the students thought it better to construct graphics rather than use textbook graphics while studying but claimed to use textbook graphics more frequently than constructing graphics while studying.

DISCUSSION

The graphic climate questionnaire developed and tested in this study met two of the specified requirements for adequacy. The questionnaire proved to be reliable and easily administered and analyzed. It did not meet the third: it lacked content validity for seventh and eleventh graders. In other words the students in this study did not perceive the content of the questionnaire as a whole. However, the data suggested that the five categories were content valid for seventh and eleventh graders.

Two courses of further research are indicated. On one hand one might investigate the possibility of splitting the questionnaire into parts. One could refine, develop, and test each of the five categories. One also could split the questionnaire into two--the cognitive and affective graphic climate questionnaires. This splitting is supported by the fact that most of the items which did not correlate even moderately with the questionnaire belonged to the two cognitive categories. On the other hand, one might leave the categorical structure of the

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questionnaire intact and revise the questions in the categories. The questions at present are quite specific. Perhaps they are too specific for seventh and eleventh graders to see the unity of the questions.

The two research plans are compatible. Which to pursue depends on one's motives. The investigators prefer to keep the categories and revise the questions when they are concerned about the classroom and school utility of the graphic climate questionnaire. Five questionnaires, each a third the size of the existing one, would require substantially more time to administer and analyze. When the investigators are enamoured of research for its own sake, they prefer to divide the graphic climate questionnaire. The more data the merrier.

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TABLE 1

Item Score/Total Questionnaire Score and Items Score/Total category Score Pearson r Correlations

Item	11th Grade Questionnaire r	11th Grade Category r	7th Grade Questionnaire r	7th Grade Category r
The Use and Construction of Graphics				
1A	.40	.47	.24	.36
1B	.52	.54	.28	.31
1C	.46	.55	.31	.46
2	.67	.73	.51	.54
3A	.35	.52	.32	.60
3B	.42	.62	.40	.62
3C	.45	.65	.39	.71
4	.44	.67	.42	.58
The Comprehension of Graphics				
7	.48	.59	.25	.59
8A	.39	.81	.30	.77
8B	.39	.81	.30	.73
8C	.33	.76	.26	.68
8D	.43	.76	.34	.66
8E	.28	.71	.35	.50
The Value of Using and Constructing Graphics				
5A	.62	.67	.58	.60
5B	.55	.60	.49	.57
5C	.54	.62	.48	.60
5D	.56	.54	.48	.49
5E	.44	.52	.40	.50
6	.63	.51	.63	.67
16	.46	.61	.44	.47
17	.46	.52	.51	.54
The Value of Textbook Graphics				
9	.61	.69	.54	.72
10	.56	.63	.61	.71
11	.04	.35	.10	.36
12	.45	.63	.39	.59
18	.57	.74	.49	.70
The Value of Learning more about Graphics				
13	.49	.78	.42	.84
14A	.41	.84	.33	.82
14B	.51	.85	.41	.77
15	.44	.70	.49	.66

TABLE 2

Means and Standard Deviations of Items for 11th and 7th graders

	M		SD	
Item	11th	7th	11th	7th
	The Use and Construction of Graphics			
1A	1.90		.77	
1B	2.65		.75	
1C	2.22	2.60	.83	1.00
2	2.41	2.77	.86	1.00
3A	1.23	1.57	.53	.79
3B	1.40	1.89	.68	.93
3C	1.46	2.00	.67	1.00
4	1.44	1.71	.64	.90
	The Comprehension of Graphics			
7	2.86	2.94	.70	.83
8A	3.49	3.36	.65	.78
8B	3.39	3.12	.64	.90
8C	3.37	3.19	.68	.88
8D	3.51	3.38	.65	.86
8E	3.01	3.23	.70	.81
	The Value of Using and Constructing Graphics			
5A	2.73	3.05	.74	.82
5B	2.66	2.87	.74	.89
5C	2.72	2.90	.78	.95
5D	3.11	3.13	.77	.86
5E	2.59	3.03	.82	.95
6	2.33	2.72	.80	.98
16	2.75	3.03	.71	.89
17	2.59	2.88	.71	.80
	The Value of Textbook Graphics			
9	2.90	2.90	.72	.92
10	3.02	3.11	.51	.66
11				
12	3.23	3.36	.61	.66
18	3.17	2.79	.72	.90
	The Value of Learning more about Graphics			
13	2.60	2.79	.72	.84
14A	2.66	2.79	.66	.82
14B	2.81	3.10	.73	.77
15	2.71	2.81	.68	.87

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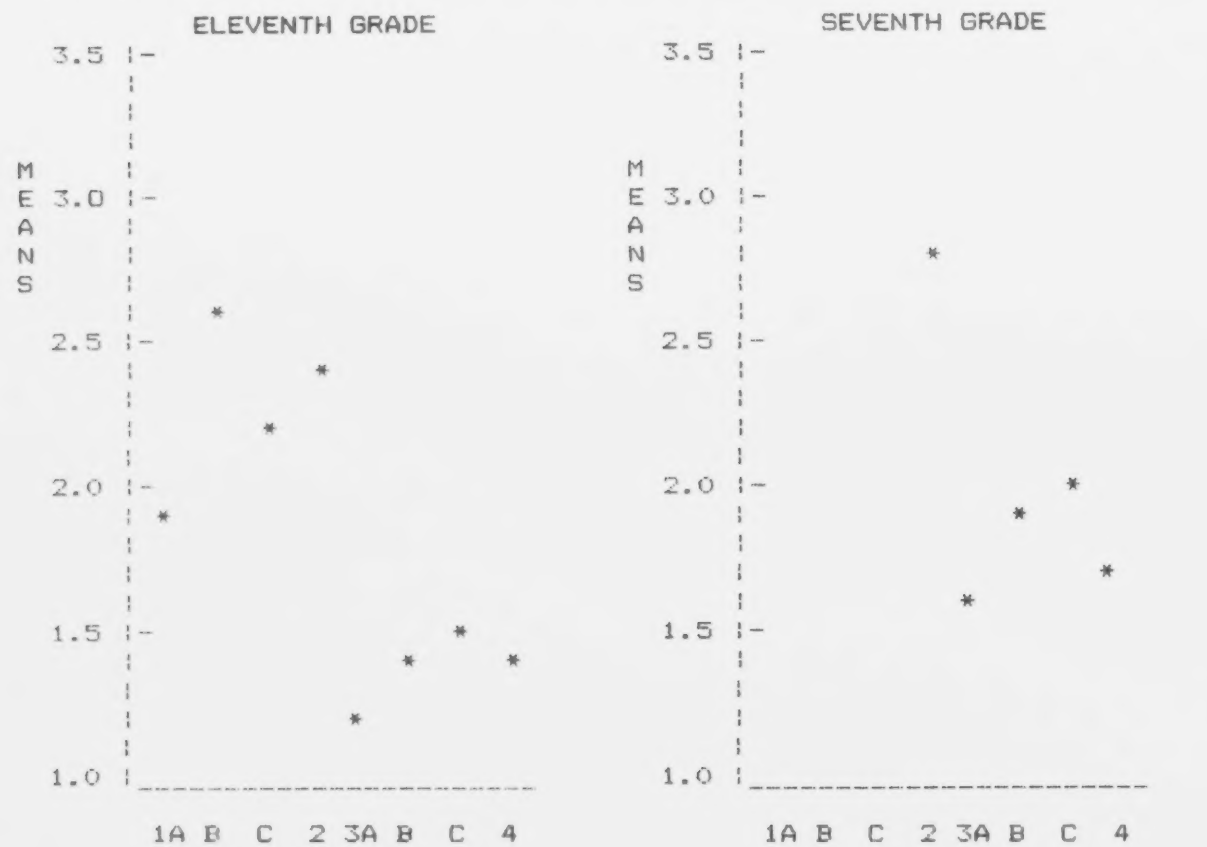
FIGURE 1.

THE USE AND CONSTRUCTION OF GRAPHICS: MEANS AND STANDARD DEVIATIONS



	Question			SD	11	7
1	When I have an assignment, I use the graphics in my social studies text-book to help me understand what I read--	A	BEFORE	.77		
		B	DURING	.75		
		C	AFTER	.83		
2	I use the graphics in my social studies textbook when I study for a test.			.86	1.00	
3	When I have a social studies assignment, I make a graphic to help me understand what I read--	A	BEFORE	.53	.79	
		B	DURING	.68	.93	
		C	AFTER	.67	1.00	
4	I make graphics when I study for a social studies test.			.64	.90	

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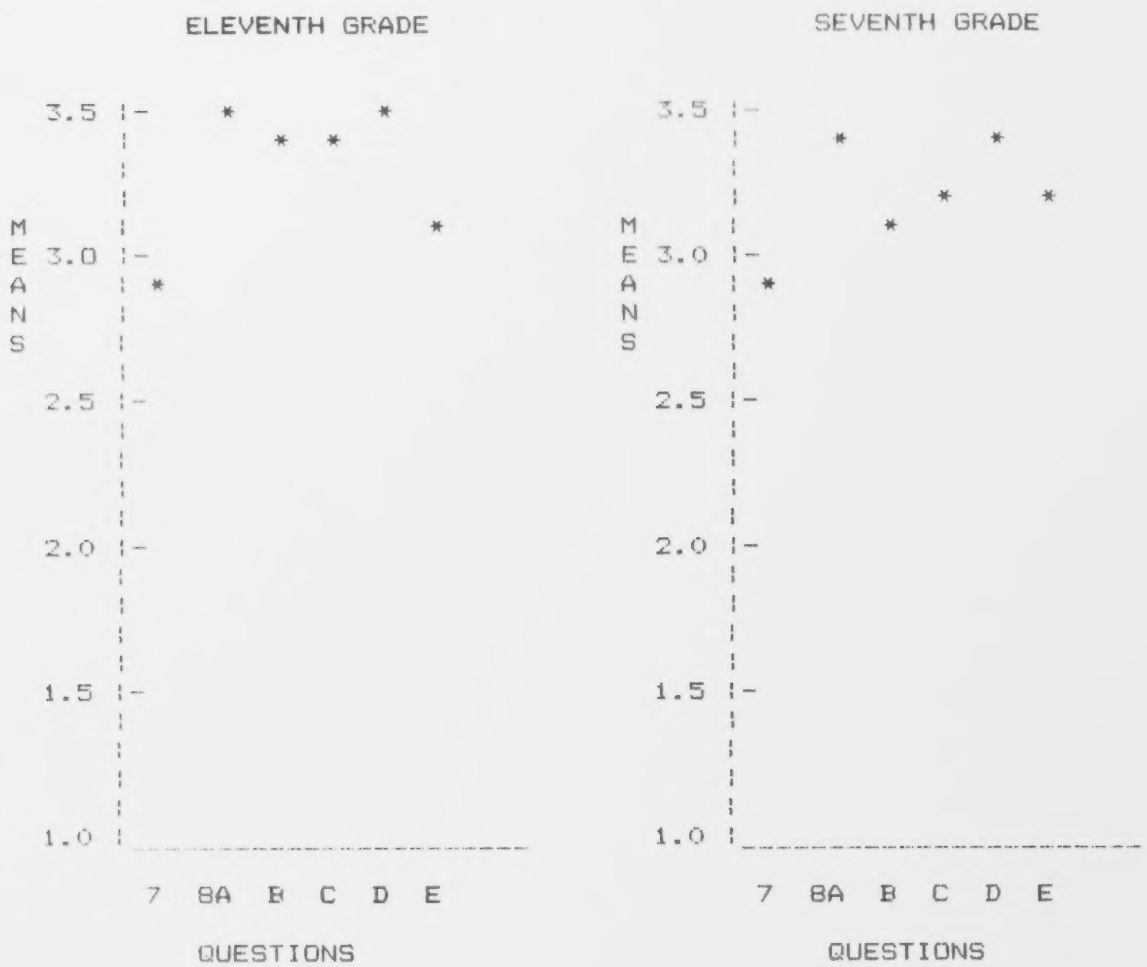
FIGURE 2.

THE COMPREHENSION OF GRAPHICS: MEANS AND STANDARD DEVIATIONS



Questions			SD	11	7
7	I know the answers to graphics questions on social studies tests.			.70	.83
8	I understand the following types of graphics--	A	GRAPHS	.65	.78
		B	CHARTS AND FLOW CHARTS	.64	.90
		C	ILLUSTRATIONS	.68	.88
		D	MAPS	.65	.86
		E	CARTOONS	.70	.81

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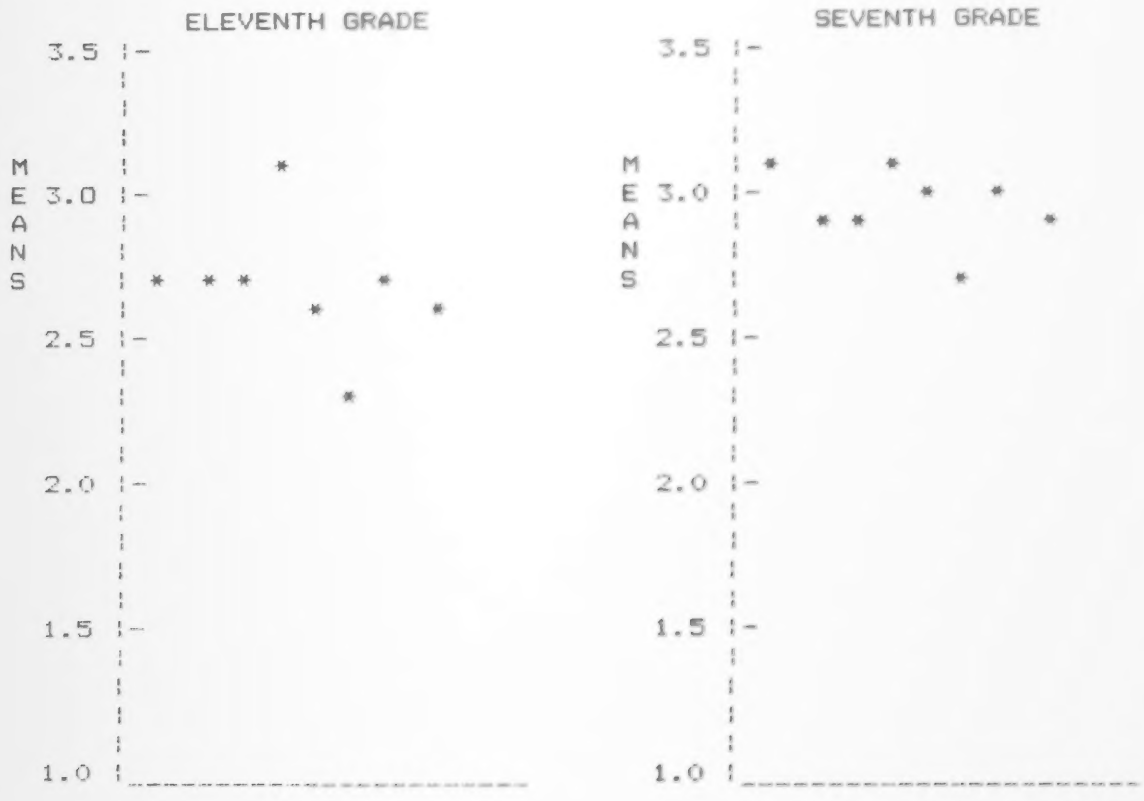
FIGURE 3.

THE VALUE OF USING AND CONSTRUCTING GRAPHICS: MEANS AND STANDARD DEVIATIONS



Questions			SD	11	7
5 The following graphics in my social studies textbook help me understand what I read--	A	GRAPHS		.74	.82
	B	CHARTS AND FLOW CHARTS		.74	.89
	C	ILLUSTATIONS		.78	.95
	D	MAPS		.77	.86
	E	CARTOONS		.82	.95
6 The graphics in my social studies textbook help me study for tests.				.80	.98
16 Making graphics helps you understand what you read in a social studies textbook.				.71	.89
17 Making graphics helps you study for a social studies test.				.71	.80

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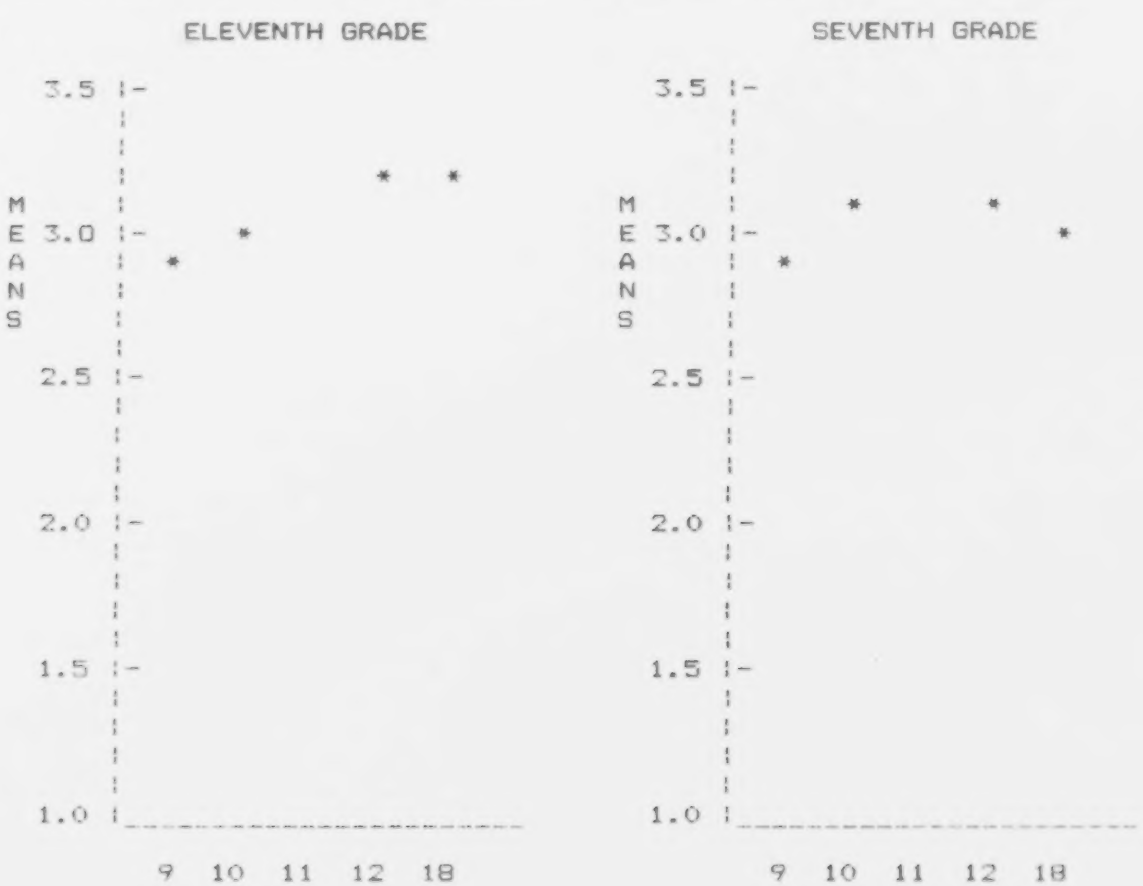
FIGURE 4.

THE VALUE OF TEXTBOOK GRAPHICS: MEANS AND STANDARD DEVIATIONS



Questions	SD	11	Z
9 I like the graphics in my social studies textbook.		.72	.92
10 The graphics in my social studies text book are useful.		.51	.66
11 One of the main purposes of the graphics in my social studies text book is to make the textbook attractive.			
12 One of the main purposes of the graphics in my social studies textbook is to make the textbook easier to understand.		.61	.66
18 Social studies textbooks with graphics are easier to read than social studies textbooks without graphics.		.72	.90

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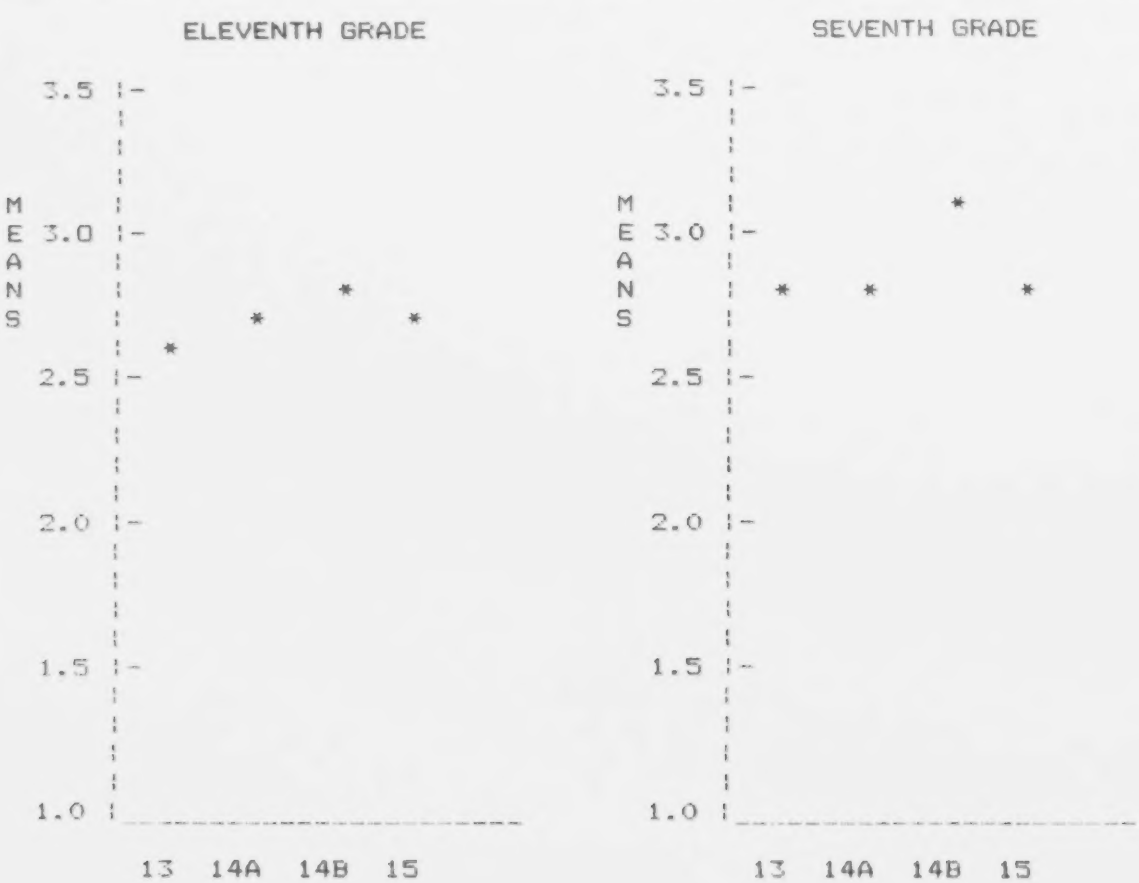
FIGURE 5.

THE VALUE OF LEARNING MORE ABOUT GRAPHICS: MEANS AND STANDARD DEVIATIONS



Questions			SD	11	7
13 I would like to learn more about how to understand graphics				.72	.85
14 I would like to learn more about how to use the graphics in my social studies textbook while--	A	READING		.66	.85
	B	STUDYING		.73	.79
15 I would like to be able to use the graphics in my social studies textbook more often during class.				.68	. 87

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